designate aneurysms in which all the coats were not present, and "false" to describe those in which all the coats remained and no coagulation had occurred, but the terms were subsequently applied in exactly an opposite sense. It is evident that such distinctions are of no definite value, and the terms false and true are better dropped from the terminology.

In this article the term dilatation is employed to designate a condition which, strictly speaking, probably comes under the term aneurysm as we generally use it, but there is no question that in its clinical aspect it differs considerably both from the saccular and ordinary fusiform aneurysm of the aorta. As Gairdner pointed out, in these cases of diffuse dilatation of the aorta there is nothing that, "clinically speaking, can be definitely called a tumor."

It is surprising how little attention has been given to diffuse dilatation of the aorta, although it has long been recognized. In some text books it is referred to under the headings of chronic aortitis and aneurysm. Morgagni distinguished between the enlargement which involved the whole circumference of the aorta and that which rose from one part, while Scarpa did not regard the enlargement of the whole aorta as aneurysm. Vieussens and Boerhaave also recognized the condition, but it is not always easy to make out whether they are describing a large fusiform aneurysm or the diffuse dilatation.

The first accurate description was given by Joseph Hodgson[2] in 1815, who distinguished the condition from ordinary aneurysm and referred to it as a "preternatural permanent enlargement of the cavity of an artery." By many French writers the condition is termed *maladie de Hodgson*, although some regard an associated aortic insufficiency as an essential part of the picture. Thoma,[3] in 1888, wrote extensively of this form, and gave one of the best descriptions of it. As Osler points out, it is a striking commentary on the difficult yof recognition that, of the cases studied by Thoma,[3] very few had been recognized clinically. It is one of the conditions which has heretofore been more often found in the dead house than recognized in the wards. This is due to various reasons: the condition itself may not give any symptoms, and its signs are overlooked; or signs suggesting some other disease, especially angina pectoris, may cause error; or the signs of associated cardiac disease may dominate the picture.

For this study a series of sixty-cases is considered, all of which occurred in the wards of the Johns Hopkins Hospital or were seen in consultation.

ETIOLOGY. There are probably two main groups, one in which the dilatation occurs with an acute infectious disease, notably

[2] Diseases of Arteries and Veins, London, 1815.

[3] Virchow's Archiv, 1868, cxi, 76; 1888, cxii, 259, 383; 1858, cxiii, 244, 505.

rheumatic fever, and the second in which the factors are essentially those which cause arteriosclerosis and aneurysm. In the latter group the essential factor appears to be disease of the vessel wall, with loss of elasticity and subsequent dilatation, probably largely in the nature of a mechanical process. The various factors in this series are as follows:

1. *Age.* Eleven to twenty years, 1; twenty-one to thirty years, 1; thirty-one to forty years, 16; forty-one to fifty years, 16; fifty-one to sixty years, 16; sixty-one to seventy years, 8; seventy-one to eighty years, 2.

Of the 18 patients under the age of forty years, 15 were males (9 white and 6 colored) and 3 females (1 white and 2 colored). The relative preponderance of colored patients among the younger ones is a striking commentary on their tendency to early vascular degeneration. The majority of these 18 patients gave a history of severe muscular exertion for many years; there was a definite history of syphilis in 6 of them, and 7 had aortic insufficiency, while in 5 of the last 10 cases there was a history of heavy drinking. It will be noted that the number is the same in the fourth, fifth, and sixth decades. In regard to the small number in later periods it must be kept in mind that these figures come from a general hospital, and that those with diffuse dilatation in later life rarely have any symptoms from it. It occurs not uncommonly without any symptoms in the aged in almshouses and asylums, and is only recognized at autopsy.

2. *Sex.* The condition occurs most often in males, as might be expected. In this series there were 54 males and 6 females, 4 of the latter being colored.

3. *Color.* The colored race shows a relatively high proportion; of this series, 39 were white and 21 colored (the total medical admissions being about 5 to 1). This is in agreement with the relatively high incidence of aneurysm and sclerotic vascular disease among them, due probably to alcohol, syphilis, and hard work. The total medical patients with aneurysm numbered 399 (white 239, colored 160), so that the relative proportions for aneurysm and dilatation of the aorta are about the same.

4. *Syphilis.* This stands out as an important cause, but probably not so markedly as in aneurysm. There are two principal forms of dilatation influenced by syphilis, one in which the process occurs with an acute syphilitic aortitis, usually seen in young adults, and the other in which the condition results from general chronic changes in the vessel wall. In this series there was a definite history of syphilis in 17 cases and probable in 8 cases. The Wassermann reaction was tried in 8 cases, with a positive result in only 3 cases. This is in such striking contrast to the results in aneurysm that it suggests that syphilis does not play such an important etiological part in dilatation.

5. *Work and Muscular Exertion.* These are factors in dilatation exactly as they are in the production of general arteriosclerosis. Occupations which involve very severe exertion at irregular times, such as that of stevedore, will evidently favor the condition. A sudden increase in the blood pressure must have more influence on the aorta than on any other vessel. In this series 39 of the patients had done hard muscular work, 7 were engaged in business, and 7 did housework. The others had light occupations. Among those who had done hard work, in a large proportion this had involved severe sudden irregular exertion. This is very striking in going over the histories, and an unusual proportion of the men had occupations which involved the lifting of heavy weights.

6. *Alcohol.* How much this is a factor, it is difficult to say. In this series 25 had used alcohol to excess, and 22 were described as moderate users, which is certainly a high proportion.

7. *Acute Specific Infections.* These probably play a more important part than is generally considered, for when we remember how much damage may be done to the aorta in the course of an attack of typhoid fever, it seems probable to suppose that later changes may gradually develop, especially if other factors are added. Whether or not there is a true primary aortitis apart from syphilis is difficult to say, but it seems probable to suppose that it may occur. There is one infection in which dilatation may occur during the acute attack. This is rheumatic fever, in which there may be an acute dilatation of the aorta, usually with aortic endocarditis. There was a definite history of this disease in 13 cases, and in 6 others of an attack of acute arthritis the nature of which was doubtful. A striking feature was the large proportion of the younger patients who gave a history of rheumatic fever, for of the 18 patients under the age of forty years, 9 had suffered from rheumatic fever, several with repeated attacks, which seems a high percentage. As the majority of these had aortic insufficiency, it is a reasonable supposition that acute aortitis occurred, which was followed by chronic changes. Even in young children dilatation of the aorta may occur with aortic endocarditis in rheumatic fever, and it seems reasonable to suppose that this is permanent in some cases. There was a history of typhoid fever in 8 cases, 3 of these being below the age of forty years. In one case, a man aged thirty-three years, the symptoms began during recovery from an attack of typhoid fever, but he had several attacks of rheumatic fever previously. The same condition may occur with acute sepsis. Some writers have suggested that there might be an extension of inflammation from an endocarditis, pericarditis, or pleuritis. It seems reasonable to suppose that if recovery followed an attack of acute aortitis, a chronic condition with tendency to dilatation would be left.

8. *Old Age.* This is only a cause in so far as the passage of years brings sclerotic changes. It is probably then only to be regarded as one of the natural changes.

9. *Malaria.* There are few conditions for which malaria is not given by some one as a causal factor. There does not seem to be any evidence to suggest any association with dilatation of the aorta, but it is constantly repeated by various authors.

10. *Severe Strain or Exposure.* The importance of a factor such as this is difficult to estimate, and any effect is probably only in causing symptoms to appear from a condition already present. There is one striking example in this series:

The patient, a white male, aged thirty-seven years, a ship captain, came complaining of shortness of breath. He had not had typhoid fever, rheumatic fever, or pneumonia. Although he had followed the sea most of his life, there was no history of syphilis, and he had used alcohol very moderately. His illness began one month before, previous to which he had been perfectly strong and well. His ship caught fire, and they had to take to the boats. Naturally he was under a heavy mental strain, and in addition was exposed to bad weather before they were picked up, as a result of which he had a severe attack of bronchitis, with which there was shortness of breath, which continued. He had a well-marked dilatation of the aortic arch, seen with the fluoroscope, with dulness over the manubrium and in both the right and left first and second interspaces, where there was a faint visible pulsation. The heart was not enlarged; the sounds were clear, the second being very ringing. The pulse rate was normal, and there was moderate thickening of the peripheral vessels. His symptoms gradually cleared, and he has been well for some years.

11. *Trauma.* The influence of this is most probably shown in determining the onset of symptoms. In one patient, a miner, aged thirty-nine years, the onset of symptoms followed an injury sussustained by being struck on the chest by a dump cart in a mine. He was knocked unconscious and remained so for twenty minutes. On recovering consciousness he had dyspnœa and severe pain in in the chest, which became less after three weeks, but the dyspnœa continued. He was found to have aortic insufficiency, which was thought to have been due to rupture of an aortic cusp. He had been previously a very hard worker in a steel plant, where he carried heavy weights, had drunk heavily, and probably had syphilis, so that there were causal factors other than the trauma.

MORBID ANATOMY. The lesions include those of chronic aortitis and secondly the dilatation. This is of varying extent, and may involve only a portion of the thoracic aorta or extend throughout the whole course of the thoracic and abdominal aorta. In the cases of this series coming to autopsy the process did not extend beyond the point where the aorta passes through the diaphragm. The dilatation may end here very abruptly; thus, in one case the aorta measured 8 cm. in circumference at the lower part of the dilatation, and only 4.5 cm. below. The form of the dilatation is various, and may be spindle, spheroid, or pyriform in shape, or sometimes like a flabby bag. The orifices and part of the vessels given off from the aorta may be involved in the dilatation.

Associated conditions may have a marked effect on the symptoms. Thus, if the chronic sclerotic process has involved the aortic ring, there is likely to be aortic insufficiency in consequence of the valvular changes. If the first part of the aorta is specially involved there may be coronary artery disease. If the orifice of the left subclavian is narrowed the pulse in that arm may be small. One result is of special interest, namely, relative aortic insufficiency due to dilatation of the aortic ring. There were two such cases in this series. In one case a loud aortic diastolic murmur was heard for some time, which disappeared before death, and at autopsy the aortic valves were normal and apparently closed the orifice completely. Probably the decrease in blood pressure, for some days before death, allowed the dilatation of the aorta to diminish and the aortic ring returned to its usual size.

Thrombus formation in the dilated aorta is not common. Osler[4] mentions a specimen in the Museum of McGill University in which the descending thoracic and abdominal aorta was dilated and the abdominal aorta filled by a densely laminated thrombus. Although in the majority of cases the aorta shows marked gross evidences of disease, yet this is not always the case, and the intima may be smooth and apparently normal.

The association of sacculated aneurysm with dilatation of the aorta is mentioned, but no instance was found in the cases of this series which came to autopsy. In one case with general dilatation of the aortic arch there was an aneurysm of the left axillary artery. Thoma figures an instance in which a secondary aneurysm arose through a rupture of the wall of the dilated aorta.

SYMPTOMS. Dilatation of the aorta rarely exists alone, and hence it is difficult to decide which symptoms are due to it and which to associated conditions. When present alone, especially in old people, it may not cause any symptoms, as is proved by the discoveries of the autopsy room. Symptoms due to valvular disease, especially aortic insufficiency, myocarditis, coronary artery disease, and angina pectoris, may be present. The effort to eliminate these as far as possible is made in this study, and it is important to try to decide to what extent we have a definite clinical picture due to dilatation. I believe that in many instances the picture is characteristic, and that the diagnosis can be made with reasonable certainity even before it is confirmed by a fluoroscopic examination. The history of a typical case brings out the general features.

The patient was a male, aged fifty-six years, a merchant by occupation. He came complaining of occasional uneasy feelings in the thorax, which he described as being rather more than oppression and yet less than severe pain. He was rather apologetic about consulting a physician, as he feared he might be thought to be making too much of a little thing. The family history was negative. In his previous history it was found that the patient had had diphtheria, measles, and typhoid fever. He had not been a specially heavy eater, but had always used alcohol rather freely. For some years he had been working at high pressure, carrying a great deal of responsibility and a heavy load of worry. There was no history of lues.

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[4] Modern Medicine, iv, 463.

For about two years he had noted at times, especially with any sudden exertion, such as running for a car, or any unusual excitement, that he had a curious feeling in the chest. This was generally described as being in the sternum or a little to the left of it, although at times it was apparently more marked at the lower end of the sternum, and occasionally it radiated into both shoulders. None of these attacks were at all alarming, and he was always able to go on, although sometimes he had to rest a few minutes before doing so. No one had ever commented on anything strange in his appearance when they occurred. He himself thought it was needless to seek advice, but the continuance of the symptoms rather worried him.

The patient was the picture of robust health; he was well nourished and had a good color. The lungs were clear throughout. The visible cardiac impulse was not marked; the maximum impulse was in the fifth interspace inside the nipple line; the area of dulness was not increased, and except for a soft systolic murmur in the pulmonic area, the sounds were clear. The pulse was 72, of good volume and regular; the blood pressure was 135 mm. On inspection, there was a distinct lift of the manubrium and a visible pulsation in the first and second right and left interspaces. On percussion, there was dulness over the manubrium and to either side. On auscultation, both sounds were heard at the base, the second with a marked ringing, amphoric quality, which could be made out over a rather wide area. The fluoroscopic examination showed a diffuse enlargement of the whole aortic arch, and a shadow could be seen both to the right and left of the sternum, continuous with that of the heart. This patient has been under observation for nearly four years and no material change has occurred, except that the "attacks" have decreased and are now infrequent.

Clinically there are several groups of cases, which usually can be separated without much difficulty:

1. *Latent Cases.* Absence of all symptoms is especially likely to occur in old people, and the condition is often found unexpectedly post-mortem. In this series there were nine patients in whom the condition was recognized only by the routine examination, as they made no complaint of any symptoms which suggested disease of the cardiovascular system. One was admitted for diabetes, one for chronic alcoholism, one for organic disease of the spinal cord, one

for lipoma, one for diarrhœa, and the others for indefinite complaints. In all the diagnosis was confirmed by the fluoroscopic examination.

2. A group in which *cardiac symptoms*, suggesting failure of the heart muscle, predominate. In the cases with marked signs of valvular lesions, aortic insufficiency predominates. The picture is often that of cardiac failure, which is the final stage in the majority of cases, not because of the dilated aorta, but on account of the associated condtions.

3. A group with features much like those of *angina pectoris;* in fact, sometimes it may be difficult to say that angina is not present. There were fifteen patients in this series in whom the pain might be described as anginoid, and others gave a history of it. In all of those who had the attacks of thoracic pain while under observation it was noted that the severity was less than that usually seen in angina pectoris.

4. A group in which the symptoms are those of the condition in the aorta itself, the heart being practically normal. These patients often give a history of symptoms which suggests cardiac disease.

*Complaint.* This usually suggests some circulatory disturbance. The most frequent is shortness of breath and dyspnœa, usually not constant unless there is a marked cardiac condition present. Next in frequency is the complaint of thoracic pain of varying degree. Œdema of the feet and legs, which in several occurred without the heart showing any signs of disease, is fairly common. Weakness is rather a frequent complaint, and loss of weight, cough, palpitation of the heart, syncopal attacks, giddy feelings, hoarseness, thumping in the chest and neck, change in the voice, and indefinite pains were also mentioned by some patients. Only one patient complained of difficulty in swallowing; this was verified by observation and occurred quite frequently. That certain patients had no symptoms referred to the vascular system has to be remembered in regard to the figures.

*Onset.* This was gradual in 41 and sudden in 10 (9 had no symptoms); in 3 of the latter it followed unusual exertion, in 1 injury, in 1 severe mental strain and exposure, in 1 the change to a high altitude, and in the others there was no definite cause.

*Dyspnœa* was the most common symptom, and occurred in 42 cases. Its severity depended largely on the state of the heart, and when this was normal it was usually brought on by special exertion or excitement. Cough accompanied it in 16 cases, in 3 with spitting of blood. A striking point in several cases was that the dyspnœa was quite out of proportion to anything that could be found to account for it.

*Œdema* of the feet and legs occurred in 16 cases. In several of these the heart seemed normal in every way, and, as a rule, the blood pressure was low.

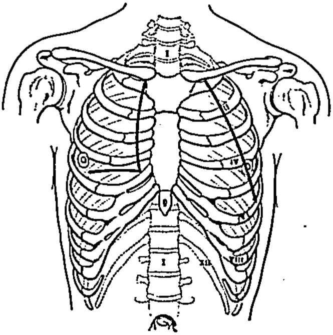
*Pain* was a prominent feature in 20 cases. In 6 of these it was referred to the chest generally without any special localization; in 4 it was referred to the left chest; in 9 it was referred to the heart, and in 5 of these it radiated to the shoulder and arm (3 to the right, 1 to the left, and 1 to both arms); and in 1 it was on the right side of the sternum. The attacks of pain were usually not very severe, but sometimes continued off and on for some hours, and generally were not accompanied by any change in the patient's appearance. In only one case was there any note of sweating with the attack of pain. Walking against a strong wind, sudden exertion, excitement, and overloading of the stomach were all given as causal factors, by which angina pectoris is suggested.

Physical Signs. With the frequent association of various cardiac conditions it is natural to have signs due to them, but these require no discussion and only features of dilatation are considered. A striking condition is marked fulness of the veins, especially those of the neck, upper thorax, and arms, the first named usually being the most dilated. The visible arterial pulsation is sometimes very diffuse, and often very marked over the carotids and subclavians. In several cases it was much more marked over the right than over the left carotid. The subclavians seem to be lifted higher than normal by the dilatation of the aorta and may be seen above the clavicles. There may be a visible swelling, as in two patients in whom a pulsating mass the size of a hen's egg was visible at the inner end of the right clavicle and in the episternal notch. With the enlargement of the aorta it would be expected that pulsation in the episternal notch would be frequently seen, and such is the case, as in 22 cases it was well marked.

A most important point on inspection is pulsation in the first and second interspaces. This is usually best seen with the patient lying down and the examiner with his eyes about on a level with the thorax; good light is essential, and the inspection should be from various positions in regard to the patient. An impulse may be seen in one interspace only or in any combination of the first and second right and left interspaces. The second right is the most frequent situation, then the second left, first right, and first left interspace. This visible pulsation, as a rule, is more diffuse and not so localized as in saccular aneurysm. In some cases it is more evident when the patient is sitting than when lying. It can rarely be felt distinctly, and does not give the feeling of being more forcible than the cardiac impulse; in fact, the pulsation in dilatation is usually more evident on inspection than on palpation. It does not lift the palpating finger, as may occur in aneurysm. There was a definite lift to the manubrium in 26 cases; this was usually better seen than felt. In 5 the absence of any visible heaving was noted, and in the remainder the point was not noted. In two cases the manubrium was prominent and there was a distinct lift of it and the inner end of both clavicles; in one, of the manubrium and right clavicle. In one the inner end of the right clavicle was lifted. In some cases it was noted that there was a widespread visible heaving, but no well-marked local impulse.

Pulsation in the back in the left interscapular space was observed in one case only. In this case it disappeared after a period of rest, which usually results in a diminution in the extent of the visible pulsation in front.

*Palpation.* In a number of cases the aorta can be palpated in the episternal notch and the subclavian arteries above the clavicles. In one case there was a distinct pulsating tumor projecting above the inner half of the right clavicle and in the episternal notch; the finger could be passed between it and the clavicle. The heaving of the manubrium could be felt in 6 cases. The contrast between the marked *visible* lift of the manubrium and the slight *palpable* lift is often very marked. The shock of the second sound was felt at the base in 9 cases. A diastolic thrill was felt over the manubrium in 4 cases, and only in the aortic area in 4. In 1 case there was a marked diastolic thrill over the right sternoclavicular joint, the manubrium, and the upper half of the sternum.



The area of dulness in dilatation of the arch of the aorta.

*Percussion.* The results of percussion are perhaps the most important in the recognition of dilatation, and the finding of dulness over the manubrium in a routine examination may suggest the diagnosis. In 55 cases of the 60 there was distinct dulness over the manubrium. In 2 cases its absence was noted, 1 being with marked emphysema, and in 3 cases there is no note. The area of dulness was usually continuous with the cardiac dulness, and generally extended some distance outside the edge of the sternum, as a rule, both in the first and second interspaces. In 28 cases it was marked in the first and second right and left, in 7 in the first right and left, in 2 in the first left, and in 2 each in the first and second right and first and second left interspaces. The width of the area of dulness varies somewhat, the usual transverse measurement being about 7 or 8 cm. The widest was 14 cm. in the first interspace, and there were several with an area of dulness measuring 10 cm. across. As a rule, the dulness is more marked to the left of the sternum than to the right. The usual area of dulness is shown in the accompanying diagram. Changes in some extent of the area of dulness occurred in several cases, some increasing and some decreasing. In some patients who have been followed for years a definite increase in the extent of dulness has been noted. In one patient, who was bled 500 c.c. with marked benefit to symptoms due to cardiac failure, no decrease in the area of aortic dulness was made out. The occurrence of an area of dulness, as described by Potain, extending from the manubrium in a segment of a circle to the right, with a shape like the "crest of a fireman's helmet," has not been made out.

*Auscultation.* When the second sound is present it often has a distinct quality at the base which is the most characteristic sign on auscultation, and in several instances first suggested the diagnosis. This is a bell-like, ringing, amphoric quality, very distinctive when once heard, and quite different from the accentuation found with high blood pressure. It has been given various descriptions, "clangoreux" by de Mussy, "bruit de tabourka" by Potain, "timbre métallique," etc. This sound may be heard over a wide area and with especial distinctness over the manubrium and in the neck over the carotids. It was well-marked in 12 of 22 cases in which the second sound was clear. In 5 cases with aortic insufficiency the second sound had this quality, and the diastolic murmur had somewhat the same. In 2 cases of aortic insufficiency in which the second sound had entirely disappeared, the diastolic murmur had this amphoric, musical quality. When aortic insufficiency is present the diastolic murmur may be heard with great distinctness over the manubrium and at the episternal notch.

*Pulse.* In the cases with no decided cardiac change there was no striking peculiarity. The rate was not particularly rapid; in about one-third of the cases it did not rise above 80, and in the same number was not above 100 as a rule. In 4 cases the rate was persistently below 70, in 1 being usually about 50 per minute.

*Blood Pressure.* It might be expected that this would be high and such a statement is made in the literature, but the results of this series show the contrary. Of course, in a condition which is so likely to be associated with other vascular lesions, there are many factors which influence the blood pressure. However, in the cases in which the aortic dilatation was the prominent factor the blood pressure was low. This may seem surprising when we consider the common sclerotic changes, but the alteration in the aorta must have considerable effect. The large vessels by their elasticity tend to convert the intermittent force of the heart into a continuous pressure. But when the aorta is dilated and has lost its elasticity, the blood is forced into a more or less rigid reservoir and a low pressure is the result. Among 48 cases with records, in 35 the average systolic pressure was below 140 mm. (Riva-Rocci instrument, broad arm-piece). In 3 of these it rose temporarily to higher figures. In 3 patients it varied from 70 to 95, never being above the latter figure, and with an average of 80. One of these had acute endocarditis on an old chronic process, with which he died. The other had quite marked arteriosclerosis with aortic insufficiency, and was discharged from the hospital in fairly good condition. Of the remaining cases, 9 varied from 125 to 180, and the others from 150 to 260. In the majority of these the higher figures were only for short periods, the pressure falling rapidly, in one case from 200 to 130, where it remained. Practically all the patients with the higher figures had cardiac hypertrophy; in the patients without marked changes in the heart the pressure was usually between 120 and 135. Crises of hypertension described by some writers were not observed in this series. Several patients with chronic nephritis (urine of low specific gravity, containing a very slight amount of albumin and a few casts), had a low blood pressure.

In 9 cases in which there were records of both the systolic and diastolic pressure, these showed a fairly steady difference of about 30 mm. Hg. This was practically the same whether the pressure was high or low.

*Fluoroscopic Examination.* This is a most important part of the examination, and in doubtful cases is usually the deciding point. Dr. Baetjer, who has had a large experience in thoracic fluoroscopic examinations, gives the following description: "Dilatation of the aorta is marked by an increased width of the aorta. In normal conditions fluoroscopic examination reveals only the bend of the aorta projecting to the left of the sternum and just beneath the clavicle, the ascending and descending portions being invisible behind the sternum. In dilatation there is a shadow projecting to the left of the sternum and extending downward to be lost in the shadow of the heart. This shadow may vary in size and in extreme dilatation may project to the right of the sternum. This shadow persists between pulsations, showing that there is a true dilatation of the aorta. In neurotic individuals and when the blood pressure is low we frequently find the aorta, in pulsation, extending beyond the sternum, but between pulsations it invariably recedes behind the sternum and is lost to view." The degree of visible pulsation varies, but in the majority there is no great difference in the extent of the shadow during systole and diastole. In one patient with quite marked dilatation it was noted by Dr. Baetjer that the shadow to the left of the sternum did not vary, but that to the right did. This may have been due to the greater direct force of the flow from the ventricle on the first portion of the arch. In several instances it was noted that the shadow of the aorta extended unusually high in the thorax. Dr. Baetjer tells me that in several patients the position of the heart in the thorax seeemd more horizontal than normal.

*Pressure Effects.* These are interesting in view of their frequency and importance in the symptomatology of saccular aneurysm of the aorta. In diffuse dilatation they are less frequent and less serious.

(*a*) *Vascular System.* Fulness of the veins of the neck, upper thorax, or arms occurred in about one-third of the cases. In 6 cases the radial pulses were unequal, in 4 the left being the larger and in 2 the right. The blood pressure was unequal in the brachials in 3 cases, in 2 that in the left brachial being the higher. The difference varied from 13 to 18 mm. Hg. In one case the vessel with the larger volume had the lower blood pressure. The difference in the radial pulses may be due to some obstruction at the beginning of the innominate or subclavian artery, or the innominate or subclavian artery may be involved in the dilatation.

(*b*) *Respiratory Tract.* A tracheal tug was noted in 12 instances, in 4 of which it was quite marked for some time after admission, but with improvement in the general condition it disappeared. In one patient the tracheal tug was present on several occasions on admission, but disappeared under rest, and coincident with this it was noted that the area of aortic dulness had decreased. In some patients there was dulness at one or both bases, but this may have been due to the state of the heart. In 3 patients there was recurring hydrothorax on the right side, for which repeated tapping had to be done.

(*c*) *Nervous System.* There was inequality of the pupils in 9 patients. In 3 the left was the smaller, in 5 the right, and in 1 there was no note. The usual opinion has been that this was due to pressure on the sympathetic, but alterations in the circulation may be more important. There was pressure paralysis of the left vocal cord in 3 patients, and in 5 others the voice was hoarse and the cough had the "goose" quality. One patient has been under observation since 1905, at which time he had complete recurrent laryngeal paralysis of the left vocal cord, which has continued to the present. The first symptoms were two years before his first admission, when he had pain in the upper thorax, with suffocating feelings and a marked change in the voice.

In some cases the pain or numbness felt in the shoulders and arms was persistent. One patient had constant pain in the left shoulder, which occasionally radiated down the arm and to the scapula. In one patient pressure over the fifth, sixth, and seventh dorsal spines caused severe pain. The same patient had pain in the heart and left shoulder on firm pressure over the precordium.

(*d*) *Bones and Muscles.* There was no instance of perforation of the thoracic wall or erosion of the vertebræ.

(*e*) *Alimentary Tract.* Dysphagia was present in one patient. No attempt was made to prove the presence of obstruction.

It is rather surprising, perhaps, to find the pressure signs occurring as often as they do, although, of course, with less frequency than in aneurysm. They that should occur is not surprising in view of the anatomical conditions. In a previous paper on this subject[5] the view was taken that the pressure effects were comparatively few, but the study of subsequent cases has rather modified this view. Still the pressure effects are rarely serious.

ASSOCIATED CONDITIONS. Thickening of the palpable arteries was found in the great majority of the patients, and in 39 cases it was noted as being marked. In 5 there was calcification of the vessels. Aortic insufficiency was present in 27 cases, in 18 with mitral insufficiency, in 3 with aortic stenosis and mitral insufficiency. Mitral insufficiency without an aortic lesion was found in 4 cases, all having marked arteriosclerosis. The heart was practically normal, so far as could be made out, in 18 cases; in 5 others there was marked hypertrophy, and in 4 others slight hypertoropy without any valvular lesion.

RELATIVE AORTIC INSUFFICIENCY. This is rare under any circumstances, but dilatation of the arch of the aorta should favor its production. There were 2 cases in this series in which the signs suggested this condition.

The first patient was a colored female, aged thirty-two years, admitted March 25, 1898, with dyspnœa and œdema. She had marked fulness of the veins of the neck and upper thorax. The heart was enlarged to the left and there was a heaving impulse over the manubrium, with dulness, which extended into the first interspace on both sides. There was a well-marked systolic murmur at the apex and a definite diastolic murmur in the aortic area. The second sound could be well heard over the manubrium and in the neck. Later there was a diastolic shock at the base. The pulse varied from 70 to 80; it was not specially collapsing, and the pulse tracing did not suggest aortic insufficiency. The presence of the aortic diastolic murmur was noted by Dr. Osler. The fluoroscope showed dilatation of the arch. She was admitted six months later with marked dyspnœa and œdema. There was marked pulsation in the episternal notch, but the heaving of the manubrium was not as marked as on the previous admission. Over the body of the heart the second sound was much accentuated, but no diastolic murmur could be heard. She died the day after admission. The autopsy showed arteriosclerosis, hypertrophy of the heart, pulmonary thrombosis, and dilatation of the arch of the aorta, with uncompensated degeneration in the intima and media. The aortic and mitral valves were normal. The aorta was much dilated and thin, measuring 9 cm. in diameter above the valves. It showed many areas of nodular thickening, and three areas about 1.5 cm. in diameter, which were very thin.

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[5] Canada Lancet, 1907-08, xli, 821.

The second case was a man, aged sixty-four, who was admitted with dyspnœa and swelling of the feet. The heart was much enlarged, with a soft systolic murmur at the apex and a definite diastolic murmur in the aortic area. The second aortic sound had a ringing amphoric quality. Within a week the diastolic murmur had disappeared, to reappear later. Four months later he was admitted again with a curious continuous murmur best heard at the aortic area. At times it had a systolic intensification, but was very variable and markedly altered by changes in the patient's position. The diastolic murmur was not heard on later examinations.

The infrequency of relative aortic insufficiency is well recognized, and the experience of this series does not support the view expressed by Balfour,[6] that "when once dilatation of the ascending aorta is produced, the secondary development of incompetence of the aortic valves is only a question of time." Some of these patients have been under observation for years and an aortic murmur has never been heard.

*Renal System.* This showed changes in the majority of cases. A number had chronic nephritis; others had albumin and casts or albumin alone.

*Blood.* This showed no changes of any moment. The count was about normal in the majority, a few showing secondary anemia.

*Intestinal Hemorrhage.* One patient, a colored man, aged thirty-three years, had several large hemorrhages from the bowel, for which no cause was found. This is interesting in connection with the observation made by Albers, of Bremen, and quoted by Dr. Osler,[7] in which hemorrhage of the bowels occurred with dynamic dilatation of the aorta.

*Course.* In so far as dilatation of the aorta is concerned, apart from other cardiovascular lesions, there seems no reason why it should not continue indefinitely. It is the associated conditions which are of moment in the prognosis. One patient in whom the condition was recognized in a routine examination has gone for five years without any evident change, and without any symptoms which might be referred to the condition of the aorta. Serious accidents, such as occur in saccular aneurysm, were not noted in this series. There was no instance of rupture of the aorta, although it seems possible that this might occur, or of dangerous pressure signs. The mode of life must have considerable effect on the outlook, and patients who can live a quiet regular life may go on indefinitely. Unfortunately in many of the patients the occupation is an important factor in the etiology, and they are often unable to obtain easier work. Occupations involving sudden severe exertion have a very detrimental effect. In the majority of cases it is probable that the condition of the first inch of the aorta will largely determine the outlook. With serious disease of the aortic orifice or interference with the coronary circulation, the prognosis is grave.

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[6] Clinical Lectures on the Diseases of the Heart and Aorta, London, 1882.

[7] A System of Medicine, Allbutt and Rolleston 1909, vi, 669.

DIAGNOSIS. It is important to recognize the frequency of the condition and to be on the watch for it. The complaints usually suggest disease of some other organ, and the physical signs may not attract attention—they have to be looked for. There are two groups of cases in which the diagnosis may be suggested. In one the history and symptoms suggest cardiac disease, but on examination no disease of the heart is found. In the other group the history of thoracic pain may suggest angina pectoris, but careful scrutiny does not bear out this diagnosis. In many cases the dilatation of the aorta is accompanied by cardiac disease, and it is easy to rest satisfied with the recognition of the most obvious process. Of the physical signs, the visible impulse seen over the manubrium and in the adjoining first and second right interspaces, the area of dulness, the curious amphoric quality of the second sound, if this be present, and the fluoroscopic examination give the greatest aid.

Various other intrathoracic conditions have to be considered, the tendency being rather to regard dilatation as being one of these than the contrary.

1. *Saccular Aneurysm of the Aorta.* The view may be taken that there is no need to attempt to distinguish between saccular aneurysm and diffuse dilatation of the aorta. This, however, is not correct, because the treatment is entirely different. To attempt to wire a diffuse dilatation of the aorta could not possibly be of any advantage and would do harm; while as regards a prolonged period of rest, it is doubtful if this is indicated in diffuse dilatation. The outlook is also quite different, being much less favorable in saccular aneurysm. The points in the differential diagnosis are as follows:

(*a*) *Pulsation.* As a rule, the visible pulsation is more diffuse and widespread in dilatation, and an important point is the difference on palpation. The impulse in the interspaces in dilatation may be readily visible, but cannot be felt, while in the sacculated aneurysm it is more punctate and readily palpable. Very often the pulsation of a saccular aneurysm is more forcible than that of the heart. The heaving impulse of the manubrium is not readily felt in diffuse dilatation and the impulse in the interspaces may not be palpable.

(*b*) *Percussion.* The area of dulness in dilatation is more or less regular. It is found over the manubrium and perhaps on both sides of it, usually rather more to the left. As a rule, it is continuous with the cardiac dulness, whereas in saccular aneurysm very often an area of resonance is found between the cardiac dulness and that of the aneurysm. In only one instance of this series was dulness made out in the interscapular region and this was only temporary, disappearing under rest.

(c) *Auscultation.* The curious quality of the second aortic sound, already referred to, is very significant when present. The wide area over which the second sound and the murmur of aortic insufficiency, if present, is heard, may be an important point.

(d) *X-ray Examination.* This gives information of the greatest value, and in a doubtful case must be the deciding test. Naturally its value depends on the experience of the observer. The possibility of atypical pictures due to some unusual position of the aorta must be kept in mind.

(e) *Pressure Effects.* These are decidedly less in dilatation than in aneurysm, but, as noted in the discussion of the physical signs, they may be marked. Severe pressure signs, especially thoracic pain, speak against dilatation and for aneurysm. Certainly, continuous pain is rare in dilatation and the evidences of severe pressure, dyspnœa, stridor, etc., are apparently unknown. The variation in the pressure signs in dilatation has been noted.

2. *Intrathoracic Tumor.* This may give difficulty, but the pressure signs of tumor are likely to be more marked. The visible pulsation, usually so characteristic of diffuse dilatation, is not likely to be present. In a case in which there is doubt from the physical signs the examination with the fluoroscope will usually settle the question at once.

3. *Malposition of the Aorta.* If the aorta is unusually twisted, and lies further to the right than usual, there may be visible pulsation to the right of the sternum and an increase of dulness, or in patients with scoliosis, the vessel may be out of the normal position. The same may be seen in some of the thoracic deformities due to rickets with displacement of the heart and aorta, or in instances of marked changes with shrinking of one side of the thorax. The general features should suggest the diagnosis, and if there is doubt the *x*-ray examination would decide without difficulty.

In the distinction between saccular aneurysm and dilatation or malposition of the aorta, the continuance of the signs and symptoms without any great change has to be kept in mind. While a saccular aneurysm may show but little change during a considerable period, as a rule it tends to be progressive. In the absence of cardiac features, diffuse dilatation may apparently go on indefinitely without any marked change.

4. *Angina Pectoris.* The complaint of thoracic pain may suggest this diagnosis, and until the patient can be observed for some time a decision may be difficult. There is no reason why pain similar to that of angina should not occur in dilatation, especially in view

of the explanation which ascribes the pain of angina to disease of the first part of the aorta. There are certain features which are generally distinctive. The pain in dilatation is rarely so severe as in angina, is often described as more a feeling of oppression than of pain, may persist for longer periods, occurs not infrequently on the right side, and is sometimes felt in both arms. This last should always suggest dilatation. The pain in dilatation does not often seem to be caused by exertion, in fact several patients found that moderate physical exertion relieved the pain. In only one case did sweating occur with the pain. In no case, so far as known, has death occurred during an attack of pain.

5. *Cardiac Disease.* As Hodgson emphasized, the symptoms of dilatation of the aorta are often regarded as due to cardiac disease. When this does not co-exist a careful examination should prevent any mistake.

TREATMENT. Any associated vascular condition, valvular or muscular insufficiency, or myocarditis, demands its usual treatment. When present, so far as treatment is concerned, they give the usual indications. As regards dilatation itself, the main points are as follows:

*Rest.* There is no universal rule, and the question must be decided for each patient. If there is pain, dyspnœa, distress, or œdema of the feet, a period of absolute rest is advisable until relief is obtained. But rest should not be too prolonged, and in an ordinary case there does not seem any advantage in more than two or three weeks. Prolonged periods of physical rest are not advisable, and rest from worry and the strain of daily troubles seems more important. A long vacation is advisable if it be possible. In the laboring classes, to which so many of these patients belong, the problem is more difficult. Occupations which involve severe strain should be given up and every effort made to have the patient employed at some lighter task. When the patients are free of symptoms a certain amount of exercise is an advantage, if the associated conditions do not forbid. Several of the patients in this series find golf an excellent form of exercise.

*Diet.* This should conform to the general rules for arteriosclerosis. Reduction in the amount is most important, and meat especially should be limited in amount. Alcohol is best omitted, and fluids should not be taken in large amounts.

*Bowels.* It is most important to keep these freely open, for constipation seems to be especially harmful. Such purgatives as senna, aloes, cascara, and phenolphthalein may be given, and an occasional mercurial (nothing is better than 5 grains of gray powder) may be given at night followed by a saline in the morning.

*Medicinal.* There is no drug which can have any marked effect on the aorta, for the damage is done. Potassium iodide should always be given and small doses (3 to 10 grains) are probably best, over considerable periods of time. The vasodilators are usually not indicated; if high pressure is present they may be tried cautiously. Digitalis is not indicated for the aortic condition alone and may do harm. For the attacks of pain—if severe enough to demand treatment—codeine may be given by the mouth; morphine is rarely required, but should be given if the pain is very severe. Some patients, even with a low blood pressure, find that nitroglycerin ($\frac{1}{100}$ to $\frac{1}{50}$ grain) gives almost immediate relief, and there can be no objection to its use. Others find relief from a dose of aromatic spirit of ammonia (ʒi) with spirit of chloroform (♏xv).

In general, it may be said that a quiet even life, with avoidance of physical and mental strain, a diet limited especially in amount, open bowels, and meeting special indications when necessary, are the main points. With these we may hope to give the patients in whom the heart is not markedly affected many years of comfortable life. When cardiac breakdown appears, it must receive proper treatment.

Conclusions. 1. Dilatation of the aorta, considered apart from aneurysm, is relatively common and probably occurs more frequently than aneurysm.

2. Two main etiological factors stand out—(*a*) acute infections, notably rheumatic fever, and (*b*) those which cause general sclerotic changes.

3. The symptoms often suggest disease of the heart itself.

4. The physical signs are often very definite, of which visible pulsation in the upper interspaces, dulness over the upper sternum and adjoining interspaces, and the fluoroscopic examination are the most important.

5. Pressure signs are comparatively common, but are rarely severe.

6. The diagnosis can usually be readily made from aneurysm.

7. The outlook as regards dilatation is good.

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# HEART BLOCK WITH AN INDICATION OF GENUINE HEMISYSTOLE.[1]

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The case of heart block which furnished the basis for the observations which we wish to report was not of such exceptional character that a separate publication of the clinical features would be

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[1] Read at a meeting of the Association of American Physicians, Washington, D. C., May 3 and 4, 1910.